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(71) Applicant(s)
Pensacola Limited

(Incorporated in Ireland)

Simpson Xavier Court, Merchant's Quay, Dublin 8,
Ireland

(72) Inventor(s)
Liam McKenna
Dermot McKenna

(74) Agent and/or Address for Service
Marks & Clerk
57-60 Lincoln's Inn Fields, LONDON, WC2A 3LS,
United Kingdom

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(56) Documents Cited
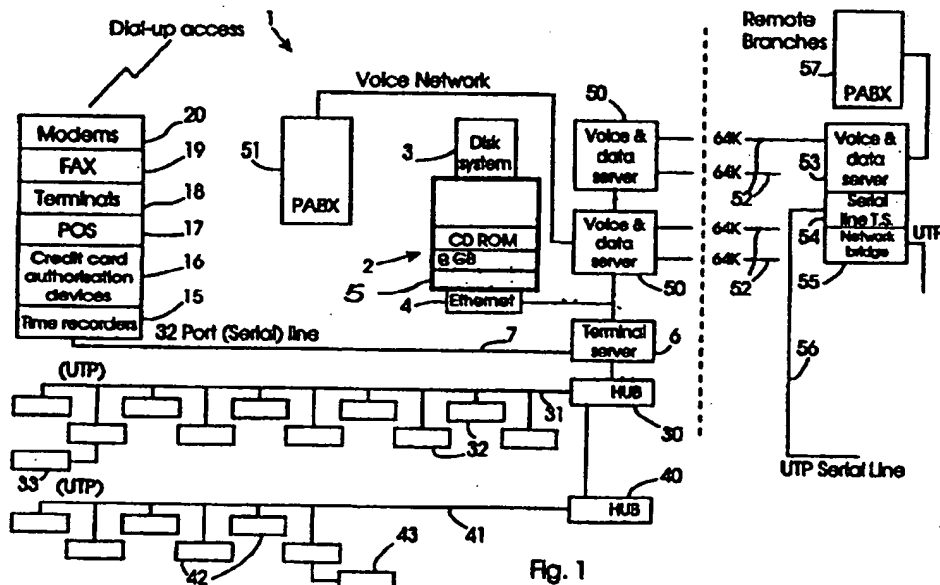GB 2221068 A   GB 2162665 A   GB 1283747 A
WO 95/30201 A1

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UK CL (Edition O) G4A ASX AUXF
INT CL[6] G06F 17/30

(54) **Retail trading apparatus**

(57)   A retail trading apparatus (1) has a central host (2) which performs real-time retail data capture to a central database. The host (2) is connected to peripherals including time recorders (15), credit card authorisation devices (16), point-of-sale systems (17), internal terminals (18), fax devices (19) and modems (20) for communication with external users. The host (2) recognises all peripherals as being equal in terms of basic data dissemination. Microcomputer networks (31-33) emulate slave terminals to retrieve data and carry out any appropriate off-line processing.
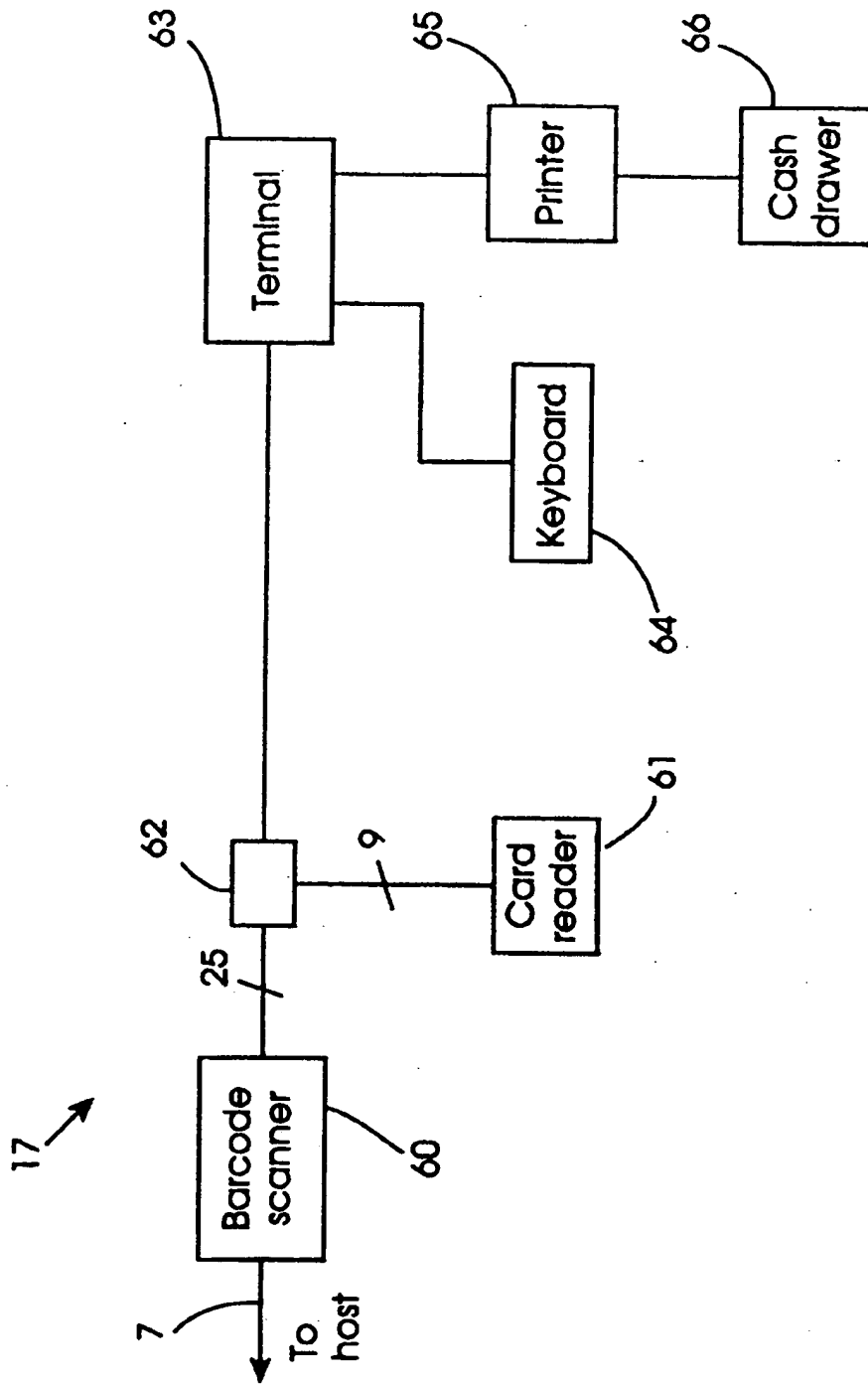
Fig. 1

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Fig. 1

Fig. 2

80

Modem
dial-back — 81

Code transmission
check — 82

Receive
signals — 87

Name and password
security check — 83

Error
flag — Filter — Automatic
disconnection

88   89

Terminal access
check — 84

90

Retrieve access
programs — 85

Transmit data/
enable write — 91

Receive
selection — 86

No

End
? — 92

To 87

Yes

Disconnect — 93

Fig. 3

100

Receive
authorisation
request — 101

Sequentially
scan file names — 102

Determine
free verifier — 103

Open disk file — 104

Transmit data — 105

Receive
verification — 106

Close file — 107

Store result
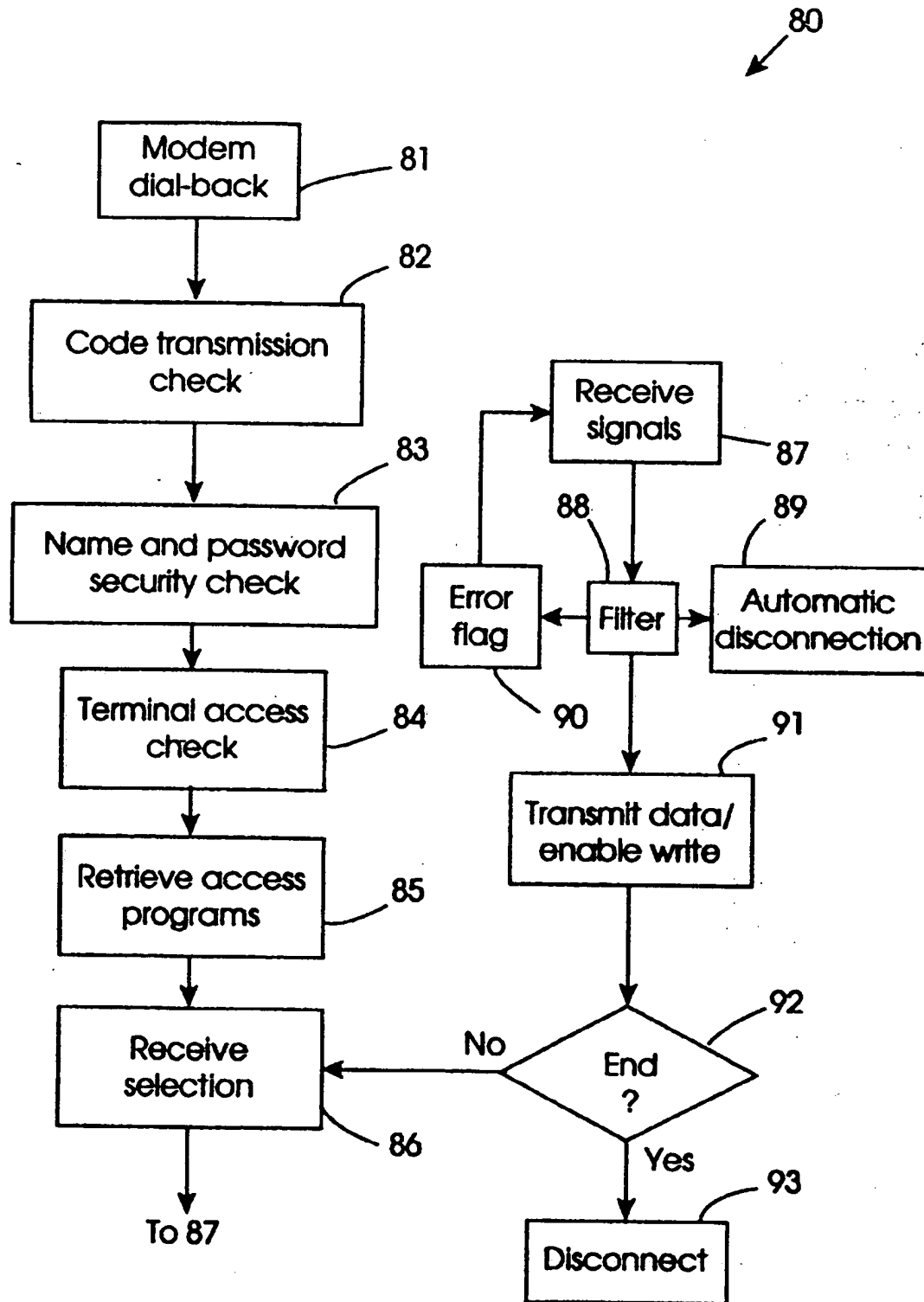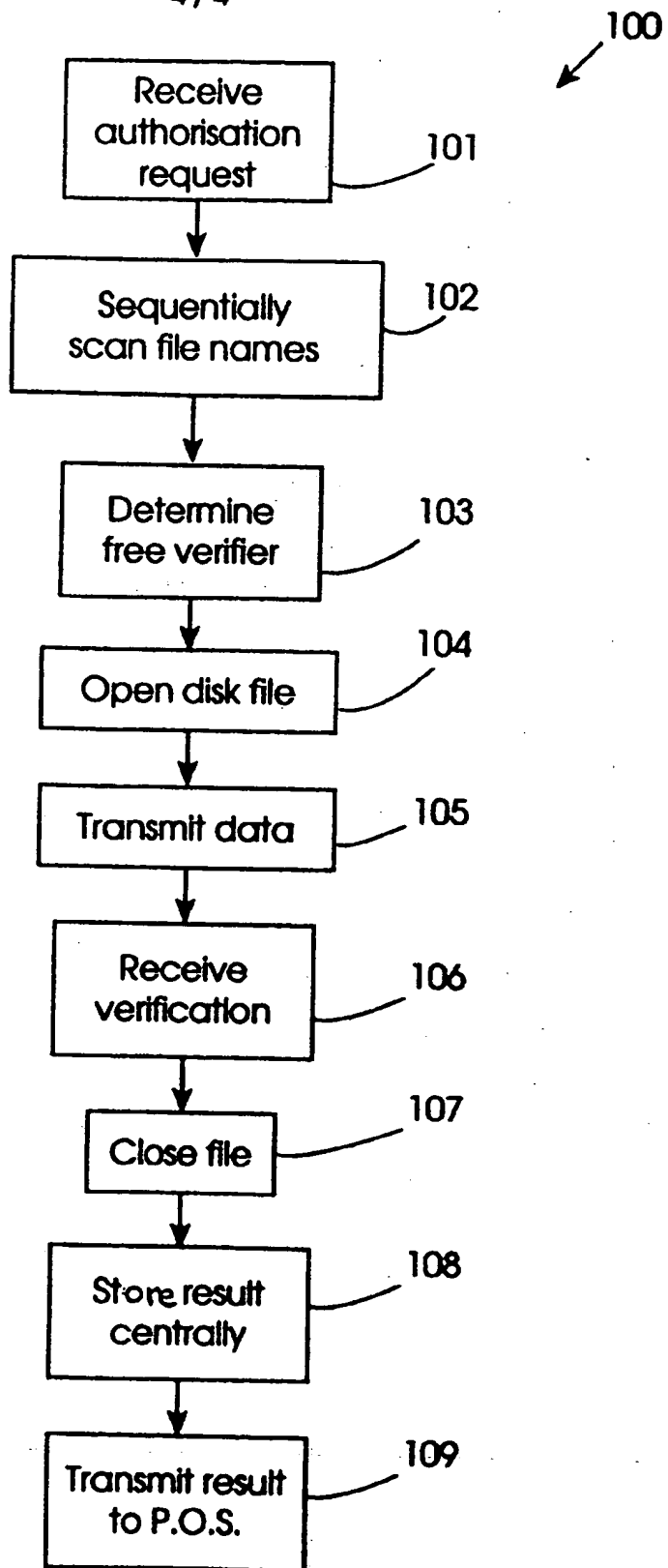centrally — 108

Transmit result
to P.O.S. — 109

Fig. 4

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"A Retail Trading Apparatus"

The invention relates to a retail trading apparatus for use in a distributed retail environment with both local and remote points-of-sale.

Heretofore, the trend in such systems has been to provide intelligent point-of-sale systems, often comprising microcomputers. Data can be retrieved from these systems for centralised data processing and generation of management reports for analysis of historical trends etc.. Retail apparatus which comprise such point-of-sale systems are described, for example, in US 4,870,577, US 4,468,750 and US 5,253,345. While such an arrangement is quite suitable for many situations, the distributed nature of the processing leads to complexity if it is desired to use a large number and wide variety of different peripheral devices for comprehensive retail trading control. Examples of such peripheral devices are modems for dial-up communication with external users, electronic fax machines, staff attendance time recorders, and bar code scanners for inventory control. Because of these complexities, it is generally not possible for users, whether internal or external, to access retail data in real-time for highly efficient inventory planning and control. Examples of external users who would benefit from access to real-time retail trading data are suppliers of the goods as it would allow them to plan their own stocks, and communicate more effectively for servicing of goods.

A more centralised approach is described in PCT Patent Specification No. WO 95/30201 (Catalina Information Resources), however, again data is stored locally at the points-of-sale and capture at the centralised database is only periodic.

The invention is directed towards providing a retail trading apparatus which provides for real-time access to retail data at all times in a simple manner.

According to the invention, there is provided a retail
5   trading apparatus comprising :

a central processing host having a plurality of processors each having a cache memory and operating at at least 100 MHz and connected on a system bus operating at at least 1.0 GB/s;

10   a disk sub-system connected to the host and having a modular disk array storing a database, and means for performing fault tolerant disk mirroring operations;

a terminal server and a serial line linking the
15   host to local peripherals; and

a voice and data server linking the host to remote branch systems of the apparatus via serial leased lines, said systems comprising peripherals, in which :-

20   the peripherals include :-

a modem bank,

point-of-sale systems, and

data entry terminals,

the host comprises means for performing on-line
25   retail data capture and distribution in real-time,

the point-of-sale systems comprising only slave retail interfacing devices and the data entry terminals being slave terminals;

the host is connected to a central bank of credit card verifiers and comprises means for performing credit card authorisation in response to point-of-sale system requests;

the host comprises means for allowing read and write remote terminal dial-up access by external users via the modem bank to stored data by addressing limited database sections with hard-coded access programs and after a security process comprising the steps of :-

a modem automatically disconnecting and dialling-back, independently of the host;

the host recognising a machine-sensed code transmitted from the remote terminal;

the host performing a user name and password check; and

the host interrogating the remote terminal, reading a terminal verifier stored in ROM, and verifying the terminal identifier; and

the host is also connected to a microcomputer network comprising means for emulating a slave terminal for retrieval of data from the host, for performing image processing of scanned documents, and immediate host updating of image processing output in real time.

Preferably, the host comprises means for allowing communication with a point-of-sale system or a data entry terminal only after reception of a machine-sensed code.

In one embodiment, the host recognises the machine-sensed
5   code by timing transmission of the code and ensuring that the transmission time does not exceed a pre-set threshold level.

In another embodiment, the threshold level is in the range 0.20s to 0.30s.

10   Preferably, the host comprises means for filtering a data access request from an external user by reading the request and comparing it with pre-defined references to determine one of three filter conditions, namely :-

automatically disconnect;

15   transmit an error flag to the remote terminal; or

allow access.

In one embodiment, the automatic disconnect filter condition arises upon detection of a host operating system
20   access request.

Ideally, the host comprises means for associating an operating system data file name with each credit card verifier, for opening the file while a verifier is busy, for closing it when free, and for sequentially searching
25   the file names to identify a free verifier upon receipt of an authorisation request from a point-of-sale system.

In another embodiment, each point-of-sale system comprises a terminal connected to a receipt printer, the printer being connected to a cash drawer and having means for control thereof.

5   In one embodiment, the host stores a directory of electronic mail addresses and comprises means for controlling external user access to the directory and transmission messages internally within the apparatus.

Preferably, the microcomputer network comprises means for
10   scanning retail dockets, recognising codes on the docket images, and for linking the images with records in a host database.

The invention will be more clearly understood from the following description of some embodiments thereof, given
15   by way of example only with reference to the accompanying drawings, in which :-

Fig. 1 is a schematic representation of a retail trading apparatus of the invention;

Fig. 2 is a schematic representation of a point-
20   of-sale system forming part of the apparatus;

Fig. 3 is a flow chart illustrating the manner in which external user dial-up data access is controlled by a host of the apparatus; and

Fig. 4 is a flow chart illustrating a process for
25   validation of credit cards.

Referring to the drawings, and initially to Fig. 1, there is shown a retail trading apparatus 1 of the invention. The apparatus 1 comprises a central data processing host

2 which is of the multi-processor type comprising 6 MIPS RISC R4400SC™ microprocessors operating at a clock speed of 150 MHz. The processors are connected to a system bus operating at 1.2 GB/s providing a 250 bit wide data path.

5 The host 2 has 128 MB of main memory and each processor has 1 MB combined secondary cache. This level of power is important in order to achieve centralised real-time data processing for immediate access of all peripherals to the current data.

10 The host 2 is connected to a disk sub-system 3 which is a high performance fault tolerant disk array sub-system having an 8GB capacity. The sub-system 3 comprises a controller which provides five full-function channels and a host channel. The controller directs mirroring of data

15 by issuing two write commands in which one channel is used as a master data channel and the other used as a back-up mirror channel. The disk drives are connected in a modular manner and the controller allows removal of a disk drive while remaining operating.

20 The host 2, as shown in Fig. 1, has an internal disk system having a capacity of 8 GB. The host 2 is programmed to write to this system while maintenance of the sub-system 3 is being performed. Thus, it permanently maintains a similar storage structure on the internal disk

25 system, while allocating spare for the operating system.

The host 2 also comprises a tape back-up system 5 and is programmed to automatically direct a backup of fresh data on a nightly basis.

The host 2 is connected by an Ethernet™ network 4 to a

30 terminal server 6 having thirty-two ports linking the host 2 to various peripheral devices. These peripheral devices include time recorders 15, credit card authorisation

devices or verifiers 16, point-of-sale systems 17, administration channels 18, fax devices 19, and modems 20.

The terminal server 6 is connected by the network 4 link to a hub 30, which in turn is connected to a network link 31 of a microcomputer network also comprising microcomputers 32 and scanners 33. There is an additional hub 40 connected to a microcomputer network comprising a network link 41, microcomputers 42, and scanners 43.

The network 4 is also connected to a pair of voice and data servers 50, each of which is connected to two remote branch systems by a 64K baud leased line 52. Each branch system has a voice and data server 53, a serial line terminal server 54, and a network bridge 55. The serial line terminal server 54 connects the server 53 with peripherals equivalent to the peripherals 15, 17, 18, 19 and 20. A network bridge 55 connects the server 53 to a microcomputer network.

A PABX 51 is connected to the voice and data server 50 at the host site, and each remote branch has a PABX 57 connected to its voice and data server 53.

The host 2 is programmed to recognise all accesses in the same general manner and via the same hardware channel. None of the peripheral devices are primary data stores, all data being stored centrally at the host 2, being captured in real-time, and distributed upon request. The peripherals 15 to 20 do not store any data. The microcomputer networks only store data retrieved from the host 2 for processing. The POS systems 17 allow the host to capture all sales data in real time, and the terminals 18 and associated bar code readers allow it to capture goods inward data in real time. Likewise, staff

attendance data is captured via the time recorders 15 in real time.

The micro-computers of the networks are programmed to emulate slave terminals to retrieve data from the host and then to perform off-host processing. All peripheral communication with the host 2 is at 9600 baud, 8 bits wide and with no party.

Before describing the core real-time data capture and dissemination performed by the host 2, some of the operations performed by the microcomputer networks is now described. These networks utilise the power of micro-computers to perform off-host data processing where this is appropriate. While they are not slave devices, they immediately transmit inputted data to the host. The level of data received by the microcomputers is restricted to that which can only be received by intelligent devices. An important example of such processing is scanning of retail dockets using the scanners 33 or 43 and performing optical character recognition of reference codes on these dockets. These codes are correlated with databases retrieved from the host in order to monitor progress of paper through the retail system for instant access. For example, where an item is returned to the supplier, a two-part docket is created, one being delivered with the item and the other being scanned and the image being related to a data record for the returned item. When the supplier issues a Credit Note, this fact is inputted to the database and the record can be erased. In the interim period, however, the fact that the docket has been scanned provides evidence that the docket was created and the goods returned back to the supplier. Such operations are important for retail trading control.

Referring now to Fig. 2, an individual point-of-sale
system 17 is now illustrated. The system 17 comprises a
bar code scanner 60 connected in series on the line to the
host, a card reader 61 connected via a connector 62 to the
5   line, and a terminal 63. The terminal 63 is connected to
a keyboard 54, and is connected via a serial connection to
a printer 65, in turn connected to a cash drawer 66. All
of the devices of the system 17 are slave devices and
operate only with interactive communication with the host
10   2 in real-time. There is no possibility for data storage
and later uploading.

To initialise use of a point-of-sale system 17 or a data
entry terminal 18, the operator must "swipe" an identity
card, the code being uploaded to the host 2. More
15   generally, the host 2 is programmed to ensure that all
accesses of the peripherals 15, 17, and 18 follow
uploading of a code which is machine-sensed, in this
embodiment by a magnetic card reader. To ensure that it
is machine-sensed, the host will disconnect if all of the
20   code has not been transmitted within 0.25s, more generally
a time in the range of 0.2 to 0.3s. This prevents keying-
in of codes and therefore helps to ensure security, and
uniformity of data. This is a very simple feature of
operation of the host, but it has been found to be very
25   effective, particularly as it is uniformly applied to all
peripherals. Once initialised, the terminal 63
communicates interactively with the host in order to
perform point-of-sale retail transaction processing.
Where the customer uses a credit card, the code is read at
30   the card reader 61, and is authorised as described below.

It will be appreciated from operation of the point-of-sale
system 17 that the host 2 captures data in real-time.
This data may then be delivered to other peripherals in
real-time.

Referring now to Fig. 3, the manner in which an external user such as a supplier can access data stored on the host 2 is described in detail. This access process is indicated generally by a modem 20 and comprises the initial step 81 of the modem receiving a handshake signal from the remote terminal and automatically disconnecting and dialling-back according to stored addresses. This is a first, low-level, security step to help ensure that unauthorised access does not occur. The next step, 82, involves the host checking that the code which is transmitted from the remote terminal is machine-sensed in the same manner as for the point-of-sale system 17. In step 83, the host 2 carries out name and password security checking. Finally, a fourth and very important aspect of security control is that the host 2 disables operation of the terminal, transmits an interrogation signal which accesses a ROM circuit on it and reads a code set for the apparatus 1, and then verifies this code. This guards against an unauthorised user obtaining a card from a user and accessing the apparatus via his/her terminal.

Once access has been allowed, in step 85, the host retrieves a suite of access programs and allows user selection of a program. Each of the programs is hard-coded with the addresses of particular portions of the disk sub-system 3 to which read and/or write access is allowed. In step 86, the external user selects a particular program and in step 87, the host receives particular data access requests in response to prompting of the access control program. An important further step is step 88 which is filtering of the received signals. The host is programmed to detect any type of host operating system access request and, in response, to automatically disconnect the external user as a filter condition in step 89. A less severe filter condition is

to transmit an error flag in step 90 if access is requested to protected data, this request possibly being caused by erroneous inputting of commands. The third filter condition is to allow read and/or write access to data as directed by the access control program in step 91. This access, however, is controlled by hard-coded programs allowing access to only particular database sections. These steps are repeated by each subsequent user selection of access programs as indicated by step 86. At the end of the session, the host disconnects in step 93.

In this way, the host provides real-time information upon receipt of a valid access request from an external user. This is essential in allowing stock control decisions to be made for day-to-day stock control and it is important for supplier stock control and liaison generally. The supplier knows at all times that he/she has access to the real-time data so that correct stock control decisions may be made. Data which can be accessed in this manner includes servers call data so that customers can be informed by retail personnel of exactly the status of servicing of his/her item such as an electrical item.

Another important aspect is that the external users are not only allowed to read certain fields of data, but also to write data to certain fields of the database. This allows, for example, a supplier to place a "hold" order to indicate that stock has been reserved for the retailer to provide an option which can be taken up within a pre-set time period. This arrangement is mutually beneficial for both the supplier and the retailer.

For communication, another important aspect is that either external users or internal users may direct transmission of an electronic message, either fax or electronic mail, by accessing a central directory of addresses in the host

and directing transmission of a message. Because of the fact that terminal users both at remote branches and at the branch at which the host is located all have access to these facilities, an external user may communicate very effectively with a wide range of personnel working for the retailer. These messages are transmitted from the fax devices 19 or the modems 20.

Returning again to Fig. 2, the point-of-sale system 17 operates totally in a slave mode, even for credit card verifying, by interactively requesting authorisation by the host. As shown in Fig. 4, the host 2 receives an authorisation request in step 101 and in step 102 sequentially scans a set of operating system file names, there being one file name associated with each authorisation device. The file names are under the control of the host operating system. By sequentially searching each possible file name in turn, the host 2 in step 103 identifies a free authorisation device by determining the first file name which has not been created. In step 104, the host opens the disk file and transmits the authorisation data to the relevant authorisation device in step 105. In step 106, the host 2 receives the verification result and in step 107, it closes the file again so that in the next scan the device will be shown as being free. In step 108, the host 2 stores the result centrally and also transmits the result in step 109 to the point-of-sale system 17. It will be appreciated that this is an extremely simple and effective way to control a central bank of credit card authorisation devices because simple operating system commands are used. There is no relationship between content of these files and the authorisation devices, the files being open simply to provide flags indicating whether or not the devices are busy. An important advantage of this arrangement is the fact that a much smaller number of verifiers is required

than is normally the case. Further, maintenance of the
verifiers is simpler as they are located at one single
location and it is easier to ensure that they have all
been updated with the latest "hot card" list. This
5   feature of course also allows the individual point-of-sale
systems 17 to be simpler and to operate totally in a slave
mode. All of the other items of the point-of-sale systems
17 are slave devices. The printer 65 is a serial impact
dot matrix printer having bi-directional print and a wide
10   range of character sets. The printer transmits a pulse
for activation of a solenoid to activate the cash drawer
66 when printed. This is a simple way of ensuring that
the cash drawer 66 is not opened unless the printer 65 is
printing a receipt.

15   It will be appreciated that the invention utilises the
simple features of various data processing devices which
are readily available to provide in combination an
apparatus which provides up-to-date information at all
times for effective retail planning and control.

20   The invention is not limited to the embodiments described,
but may be varied in construction and detail within the
scope of the claims.

CLAIMS

1.   A retail trading apparatus comprising :

a central processing host having a plurality of processors each having a cache memory and operating at at least 100 MHz and connected on a system bus operating at at least 1.0 GB/s;

a disk sub-system connected to the host and having a modular disk array storing a database, and means for performing fault tolerant disk mirroring operations;

a terminal server and a serial line linking the host to local peripherals; and

a voice and data server linking the host to remote branch systems of the apparatus via serial leased lines, said systems comprising peripherals, in which :-

the peripherals include :-

a modem bank,

point-of-sale systems, and

data entry terminals,

the host comprises means for performing on-line retail data capture and distribution in real-time, the point-of-sale systems comprising only slave retail interfacing devices and the data entry terminals being slave terminals;

the host is connected to a central bank of credit card verifiers and comprises means for performing credit card authorisation in response to point-of-sale system requests;

5   the host comprises means for allowing read and write remote terminal dial-up access by external users via the modem bank to stored data by addressing limited database sections with hard-coded access programs and after a security process
10   comprising the steps of :-

a modem automatically disconnecting and dialling-back, independently of the host;

the host recognising a machine-sensed code transmitted from the remote terminal;

15   the host performing a user name and password check; and

the host interrogating the remote terminal, reading a terminal verifier stored in ROM, and verifying the terminal identifier; and

20   the host is also connected to a microcomputer network comprising means for emulating a slave terminal for retrieval of data from the host, for performing image processing of scanned documents, and immediate host updating of image processing
25   output in real time.

2.   An apparatus as claimed in claim 1, wherein the host comprises means for allowing communication with a point-of-sale system or a data entry

terminal only after reception of a machine-sensed code.

3.   An apparatus as claimed in claims 1 or 2, wherein the host recognises the machine-sensed code by timing transmission of the code and ensuring that the transmission time does not exceed a pre-set threshold level.

4.   An apparatus as claimed in claim 3, wherein the threshold level is in the range 0.20s to 0.30s.

5.   An apparatus as claimed in any preceding claim, wherein the host comprises means for filtering a data access request from an external user by reading the request and comparing it with pre-defined references to determine one of three filter conditions, namely :-

        automatically disconnect;

        transmit an error flag to the remote terminal; or

        allow access.

6.   An apparatus as claimed in claim 5, wherein the automatic disconnect filter condition arises upon detection of a host operating system access request.

7.   An apparatus as claimed in any preceding claim, wherein the host comprises means for associating an operating system data file name with each credit card verifier, for opening the file while a verifier is busy, for closing it when free, and

for sequentially searching the file names to identify a free verifier upon receipt of an authorisation request from a point-of-sale system.

8. An apparatus as claimed in any preceding claim, wherein each point-of-sale system comprises a terminal connected to a receipt printer, the printer being connected to a cash drawer and having means for control thereof.

9. An apparatus as claimed in any preceding claim, wherein the host stores a directory of electronic mail addresses and comprises means for controlling external user access to the directory and transmission messages internally within the apparatus.

10. An apparatus as claimed in any preceding claim, wherein the microcomputer network comprises means for scanning retail dockets, recognising codes on the docket images, and for linking the images with records in a host database.

11. An retail trading apparatus substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

CRUICKSHANK & CO.

Application No:	GB 9616492.6	Examiner:	Matthew Gillard
Claims searched:	All	Date of search:	30 September 1996

- **Patents Act 1977**
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

    UK Cl (Ed.O): G4A ASX, AUXF

      Int Cl (Ed.6): G06F 17/60

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2221068 A (HITACHI LIMITED)	
A	GB 2162665 A (CASIO)	
A	GB 1283747 (DIGITAL DATA SYSTEMS CORP)	
A	WO 95/30201 A1 (CATALINA INFORMATION RESOURCES INC)	